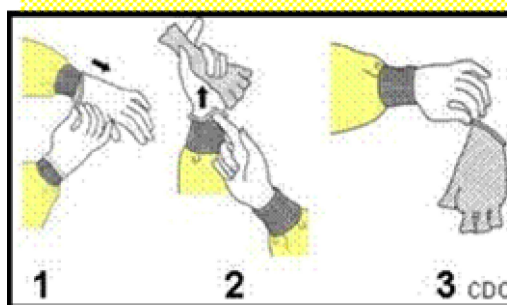


Contamination from Removing Personal Protective Equipment (8/08)

Casanova L, Alfano-Sobsey E, Rutala WA, Weber DJ, Sobsey M. Virus transfer from personal protective equipment to healthcare employees' skin and clothing. *Emerg Infect Dis* 2008;14:1291–1293.

Proper use of personal protective equipment (PPE) is designed to protect health-care workers (HCW) from pathogen exposure during patient care. The importance of PPE was underscored during the recent outbreak of severe acute respiratory syndrome (SARS). HCWs accounted for approximately 20% of cases; failure to properly use PPE was a risk factor for HCW infection. This outbreak raised concern that HCWs could contaminate their skin or clothes with pathogens during PPE removal, resulting in accidental self-inoculation and virus spread to patients, other HCWs, or fomites. The Centers for Disease Control and Prevention (CDC) addressed this concern by designing a protocol to minimize contamination to the wearer during PPE removal. To determine if removing PPE according to the CDC protocol prevents viral contamination of the wearer, a human challenge study was undertaken using a nonpathogenic virus. Ten participants were enrolled in this study and referenced a poster with the CDC protocol when donning and removing PPE. PPE (gowns, gloves, respirators, and goggles) donned by volunteers was contaminated with bacteriophage MS2, a nonenveloped, nonpathogenic RNA virus suspended in 0.01 mol/L phosphate-buffered saline and GloGerm (GloGerm, Moab, UT, USA), synthetic beads that fluoresce under UV light (for visual tracking of virus). Sites of contamination included the front shoulder of gown, back shoulder of gown, right side of N95 respirator, upper right front of goggles, and palm of dominant hand.



Participants measured blood pressure on a mannequin and then removed PPE according to the CDC protocol. Hands, items of PPE, and scrubs worn underneath were sampled for virus. The mean amount of virus recovered from the right hand (the dominant hand of 90% of volunteers) was greater than that recovered from the left hand. While removal of gloves and gowns required two hands, mask and goggle removal was one-handed, which could have resulted in larger quantities of virus being transferred to the dominant hand during removal. In the single left-handed study participant, recovery of virus was greater from the left hand than the right. The mean amount of virus recovered from scrub shirts was significantly greater than that recovered from pants ($p = 0.01$), possibly because of contact with hands when the gown is pulled away from the shoulder during removal. Transfer of virus to both hands, the initially uncontaminated glove on the nondominant hand, and the scrub shirt and pants worn underneath the PPE was observed in most volunteers. **Following the CDC protocol often resulted in virus transfer to hands and clothing. An altered protocol or other measures are needed to prevent health-care worker contamination.**

DECS Comment: PPE is available to protect us from exposure to infectious agents. While using PPE is important, it is also essential to don and remove PPE in a manner which minimizes further spread of contamination. The combination of PPE selected will affect the sequence of donning and removal. This study demonstrated that current CDC recommendations are insufficient to protect HCWs from contamination during PPE removal. The authors suggested options that might prevent such contamination including double gloving, using surgical protocols for PPE removal, or using PPE impregnated with antimicrobial agents; however, they did not recommend implementing these methods into clinical practice until their impact on the safety of HCWs has been validated with testing. The authors also emphasized the need for proper hand hygiene. As a reminder, wearing gloves is not a substitute for handwashing before donning PPE or after PPE removal. Handwashing immediately after removing PPE is essential. Also, if hands become visibly contaminated during PPE removal, wash hands before continuing to remove PPE. Until additional research is available, HCWs should be careful when removing PPE so contamination of skin and clothing is prevented and routinely wash their hands at appropriate intervals.